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Utilization Research & Development Division

Publications and Patents

January - June 1968

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CONTENTS

	Page
Introduction	3
Request for Information	3
Subject Index for Publications	4
Publications	5
Contract and Grant Research Publications	30
Republication	37
Patents	37
Licensing of Patents.	39

Northern Utilization Research and Development Division
Agriculture Research Service
United States Department of Agriculture
1815 North University
Peoria, Ill. 61604

INTRODUCTION

The Congress in 1938 authorized four regional laboratories, now known as Utilization Research and Development Divisions, to conduct basic and applied research designed to expand, improve, and develop through science and technology the utilization of American farm crops. The need and importance of such research arise because the farmer is not organized to carry on modern scientific research to maintain old markets for his products and to create new ones. Since their inauguration, these laboratories have contributed much basic knowledge of the chemical composition and physical properties of farm commodities and have applied this knowledge to create new or improved products and processing technology that have enhanced utilization of many farm commodities.

The Northern Utilization Research and Development Division is responsible for research on industrial utilization of the cereal grains—corn, wheat, barley, grain sorghum, and oats; and the oilseeds—

soybeans and flaxseed. Except for wheat and barley, the research includes food and feed uses of these crops. In the Department's program of research on replacement crops, the Northern Division conducts all screening and characterization studies on uncultivated plants and their components. It is also responsible for more intensive research on new oilseeds containing erucic acid and on new gum and pulp fiber plants. In addition to its internal program of research, it carries out work through domestic contracts and grants and conducts related research abroad under grants or contracts involving Public Law 480 funds.

The research investigations at the Northern Division are supported by more than 450 people, about one-half of whom have professional status. This body of highly trained men and women with specialized knowledge in various disciplines are responsible for the scientific publications and patents listed here.

REQUEST FOR INFORMATION

The results of the research of the Northern Utilization Research and Development Division are published regularly in the technical literature, and public-service patents are secured to cover patentable inventions and discoveries (see page 37). As a convenient guide to our publications and patents, a list with abstracts is published semi-annually. The abstracts describe the current research and indicate the progress achieved. Further information on any of the developments, as well as earlier technical papers, may be obtained by writing us.

In conformance with the policy of the Department of Agriculture, Northern Division publications are available to scientists and other specialists, librarians, representatives of the press, and others interested.

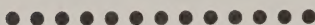
Requests for specific reprints should be by number and addressed to the Northern Division. Those

titles marked with an asterisk (*) are not available for distribution.

Most of the publications are in journals that are available in libraries. Photographic copies of most journal articles on research at this Division can be purchased from the National Agricultural Library of U.S. Department of Agriculture, Washington, D.C. 20250.

No publications will be sent regularly in response to foreign requests unless exchange arrangements have been made with the Director of the National Agricultural Library.

Copies of previous lists of publications and patents are available upon request.



[Compiled by reprint order number. Numbers marked (*) do not have reprints available for distribution.]

General:

2298,	2301,	2306,	2312,	2313,	2327*,	2329,	2331*,	2338,
2342,	2348,	2368,	189-C,	21-G*,	22-G,	23-G,	25-G,	26-G*,
27-G*,	200-F,	208-F,	220-F*,	228-F				

2306,	2314,	2315*,	2327*,	2331*,	2332*,	2334,	2335*,	2336,
2349,	2362*,	2367,	24-G,	134-F,	203-F,	209-F,	212-F*,	213-F,
228-F,	229-F,	230-F						

2272, 2308, 2345, 2364, 2370, 21-G*, 207-F

2299, 2306, 2310, 2325, 2330*, 2344, 2357, 2359*, 2362*,
21-G*, 26-G*, 27-G*, 219-F*, 221-F*, 230-F

2304,	2306,	2311,	2316,	2322*,	2323*,	2324,	2328,	2340,
2344,	2361,	2364,	2365,	2369,	2371*,	2373,	201-F,	210-F,
211-F,	217-F*,	231-F,	232-F,	234-F				

General:

2296, 2303, 2317, 2318, 2337, 2342, 2347, 2351, 2352,
2353, 2354, 2355, 2356, 2357, 2358, 2372, 190-C, 218-F*

2295*, 2307, 2326*, 2363, 2366, 187-C*, 223-F*

2321, 2339, 2354, 2358, 202-F, 204-F, 206-F, 222-F*, 233-F

2353, 2355, 163-F, 205-F, 214-F*, 215-F*, 216-F*, 224-F*, 225-F*,
226-F*

227-F*

General:

2294, 2297, 2318, 2343

1701A,	2293,	2294,	2297,	2300,	2302,	2305,	2309,	2320,
2333,	2343,	2346,	2350,	2358,	2360,	2374		

2341*

January - June 1968

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PUBLICATIONS

[Publications marked with an asterisk(*) are not available for distribution. When requesting reprints, please order by number.]

- 1701A • Addendum: Search for New Industrial Oils. XI. Oils of Boraginaceae
ROBERT KLEIMAN, F.R. EARLE, I.A. WOLFF, and QUENTIN JONES¹
(¹USDA Crops Research Div., Beltsville, Md.)
J. Amer. Oil Chem. Soc. 45(5): 408. May 1968

Among the data reported under Part XI, the sample originally identified as *Lithospermum officinale* L. has been reidentified as *Heliotropium*

europaeum L. Oil from *Moltkia aurea* Boiss. contains 6% of 18:4 instead of 16%. Oil from *Cryptantha bradburiana* Payson contains no 22:1, but 2% of 20:2.

- 2272 • Reducing the Microbial Population of Wheat and Wheat Flour
VIRGIL PFEIFER and CHARLES VOJNOVICH
Bull. Ass. Oper. Millers: 3022-3024. January 1968

Flours with microbial counts well below 5,000 per gram can be produced from wheats of high microbial population by proper combinations of wheat treatment, mill cleaning, flour stream selection, and flour treatment. Selection of wheats having low initial microbial populations simplifies the problem. Some treatment methods for wheat or flour, such as those making use of fumigants or chemical sterilants, irradiation, radio frequency or dielectric heating, or

sonic and supersonic vibrations, are at present impractical or ineffective, although a few have definite potential for application if economics can be improved and side effects eliminated. Currently, heat treatments of wheat or flour, in combination with efficient grain cleaning, washing, and good milling techniques, appear to be the most practical methods for controlling microbial populations.

- 2293 • An Octadecatrienoic Acid from *Lamium purpureum* L. Seed Oil Containing 5,6-Allenic and *trans*-16-Olefinic Unsaturation
K.L. MIKOLAJCZAK, MARY F. ROGERS, C.R. SMITH, and I.A. WOLFF
Biochem. J. 105(3): 1245-1249. December 1967

Lamium purpureum L. (Labiatae) seed oil contains 16% of a new acid characterized as (-)-5,6-*trans*-16-octadecatrienoic (proposed trivial name *lamenallenic*) acid (Ia). The acid was isolated as its methyl ester from the transesterification products of *L. purpureum* oil by countercurrent distribution based on a combination of recycle-single withdrawal techniques. Methyl *lamenallenate* (Ib) is strongly levorotatory. The structure of I is consistent with infrared, nuclear magnetic resonance, quantitative hydrogenation, and oxidative cleavage data. Hydrazine partial reduction of Ib gave a mixture of monoenes

and dienes, which were separated by preparative thin-layer chromatography. Identification of the cleavage products from these compounds gave further proof of the type and location of unsaturation in the original acid.

Other unsaturated esters identified by their cleavage products were oleate, linoleate, and linolenate. In addition, less than 1% of methyl *laballenate* [(-) methyl 5,6-octadecadienoate] was isolated and identified.

2294 • Anomalous Borohydride Reduction of Some α -Acyloxy Tosylhydrazones

K.L. MIKOLAJCZAK and C.R. SMITH, JR.
Chem. Ind. (51): 2150-2151. December 1967

Sodium borohydride reduction of a tosylhydrazone (toluene-*p*-sulphonylhydrazone) is an effective method for covering a ketone function to a methylene group. We discovered a novel extension of this reaction while attempting to apply it to the problem of structure elucidation of a series (C_{18} , C_{20} , C_{22} , and C_{24}) of naturally occurring hydroxyacetoxy fatty acids isolated from *Cardamine impatiens* seed oil.

Each fatty acid had a vicinal diol grouping on carbon atoms 9 and 10 from the methyl group, but only one of these hydroxyl groups is free; the other is acetylated. The major components of the esterified mixture are methyl hydroxyacetoxydocosanoate (60%) and methyl hydroxyacetoxytetracosanoate (25%), as determined by gas-liquid chromatography of the trimethylsilyl ether derivatives.

2295* • Research and Progress in the Use of Linseed Oil

J.C. COWAN

Proc. 36th Annual Flax Inst. U.S., Minneapolis, Minn., pp. 46-50.
November 10-11, 1966

Cooperative research of the National Flaxseed Processors Association and the Norther Division, as well as by other groups, has established that an antiscaling compound made of linseed oil and mineral spirits is a preferred material to use on concrete structures subject to freeze-thaw cycles and deicing chemicals. Other research establishes that linseed oil improves the durability of concrete even when the

road or structure undergoes no freeze-thaw cycles. Laboratory and practical road tests show that linseed oil emulsions can be used as adjuncts for curing with good-to-excellent preliminary results. Further work is needed to determine the best procedures to be followed in curing to achieve optimum value from a linseed oil coating.

2296 • Inexpensive Event Marker for Strip Chart Recorders

R.L. HOFFMANN and C.D. EVANS

J. Gas Chromatogr. 6(1): 63. January 1968

A mercury cell, resistor, capacitor, and a momentary contact switch were combined to make

a simple electronic device for marking the injection point on a gas chromatogram.

2297 • Bis(trimethylsilyl)acetamide in the Silylation of Lipolysis Products for Gas-Liquid Chromatography

W.H. TALLENT and R. KLEIMAN

J. Lipid Res. 9(1): 146-148. January 1968

When bis(trimethylsilyl)acetamide is used to silylate lipolysates for gas-liquid chromatography, the pyridine solution containing the sample and silylating agent can be injected directly onto the

column. Conversion of free fatty acids to methyl esters before silylation is unnecessary, since silyl esters elute as sharp gas-liquid chromatographic peaks.

2298 • Physical Test Data Processing by Computer in Paper Additives Evaluation

B.T. HOFREITER, J.O. ERNST, A.J. ERNST, and C.E. RIST

Tappi 51(1): 51A-56A. January 1968

Data from physical tests of experimental paper made in an additives evaluation program are processed, stored, and analyzed by computer. Raw test data are entered directly onto key punch forms and no calculations are required by laboratory technicians. The computer output includes: (1) a tabulation of the raw data, (2) a listing of test results including pertinent statistical analyses, and (3) a punched card encoding a summary of results of the principal.

properties tested. The computer system as applied to physical testing allows ready access to historical data that become an integral part of current activities rather than lost work which served a one-time purpose. The use of computer time is easily justified by the reduction in error probability, rapid preparation of reports, ease of data retrieval, and increased usefulness of stored data.

2299 • Nutritionally Unavailable Niacin in Corn. Isolation and Biological Activity

D.D. CHRISTIANSON, J.S. WALL, R.J. DIMLER, and A.N. BOOTH¹

(¹West. Util. Res. Develop. Div., Albany, Calif.)

J. Agr. Food Chem. 16(1): 100-104. January-February 1968

A substance containing bound niacin was extracted with 50% ethanol-water from commercial corn gluten, a source high in the vitamin. Rat feeding tests established that the niacin in this substance, like that of whole corn, does not contribute to the animal's vitamin requirement unless it is hydrolyzed with dilute alkali. The substance was separated from

extracted proteins through its insolubility in water and its nonadsorption on a cation exchange resin. The isolate contains carbohydrate and nitrogenous compounds, as well as niacin. Gel filtration chromatography or countercurrent distribution did not alter its composition significantly. Its composition indicates a complex structure.

2300 • Sinapine and Related Esters in Seed Meal of *Crambe abyssinica*

F.L. AUSTIN and I.A. WOLFF

J. Agr. Food Chem. 16(1): 132-135. January-February 1968

The presence of sinapine in *Crambe abyssinica* seed has been established by isolation of its thiocyanate salt from extracts of the defatted meal freed of natural thioglucosides. Assay of a series of representative defatted crambe meals showed an average content of 0.46% sinapine, reported as thiocyanate salt, or

about half the amount in commercial rapeseed meals. The occurrence in crambe seed meal of 1-sinapoyl- β -D-glucose was also demonstrated. Sinapine (as the bisulfate salt) fed to rats at levels normally encountered in crambe meal had no effect on growth rate, feed intake, or feed efficiency.

2301 • Relative Influences of Electron-Withdrawing Functional Groups on Basicities of Amino Acid Derivatives

MENDEL FRIEDMAN and JUDITH A. ROMERSBERGER

J. Org. Chem. 33(1): 154-157. January 1968

A series of phenylalanine and ξ -aminocaproic acid derivatives were prepared by treating the amino groups with α, β -unsaturated compounds. The pK_2 values of the modified amino groups were determined at 30° C. The decrease in basicities of the amino groups in the derivatives is presumably due to inductive and field effects of electron-withdrawing functional groups. A procedure to

determine these effects is described. Basicities of amino groups in amino acids modified with vinyl compounds appear to be linearly related, with one striking exception, to reaction rates of amino groups with the same vinyl compounds. The results are useful for predictions of basicities, reaction rates, and physicochemical properties of the substituted vinyl adducts of amino acids, peptides, and proteins.

2302 • Search for New Seed Oils. XV. Oils of Boraginaceae

ROGER WAYNE MILLER, F.R. EARLE, I.A. WOLFF, and A.S. BARCLAY¹
(¹USDA Crops Research Div., Beltsville, Md.)
Lipids 3(1): 43-45. January 1968

In a search for a preferred source of ν -linolenic (all-*cis*-6,9,12-octadecatrienoic) acid, seed oils of 33 species of Boraginaceae were examined. The desired triene occurred primarily in the subfamily Boraginoideae in amounts ranging from 0.2 to 18%. Oils of this subfamily also contain 0.2 to 15% of the tetraene, all-*cis*-6,9,12,15-octadecatetraenoic acid. Total unsaturation, as well as the relative proportions of the common acids, varied widely in oils of the

family. Monoene predominated in the subfamily Cordioideae, diene in Heliotropioideae, and a diverse composition among the Boraginoideae; seven had iodine values of 200 or above. *Cordia verbenacea* seed oil was unique among those examined. It had 43% of C₂₀ acids and 23% of components more volatile in gas chromatography than the usual triglycerides.

2303 • Methyl Esters of Unsaturated Fatty Acids Labeled with Tritium in the Methyl Group
T.L. MOUNTS and H.J. DUTTON

J. Label. Compounds 3(4): 343-345. October-December 1967

Methyl esters of unsaturated acids have been labeled with tritium in the methyl group by a microtechnique, which is a modification of the methylation procedure of Metcalf and Schmitz. By high-vacuum techniques high specific activity

methanol-T is introduced into a reaction flask and unreacted methanol-T is recovered. This procedure of labeling fatty acids gives products that are chemically and radiochemically pure.

2304 • Mycotoxins Produced by *Fusarium nivale* Isolated from Tall Fescue (*Festuca arundinacea* Schreb.)

S.G. YATES, H.L. TOOKEY, J.J. ELLIS, and H.J. BURKHARDT¹
(¹West. Util. Res. Develop. Div., Albany, Calif.)
Phytochemistry 7(1): 139-146. January 1968

Toxic metabolites are produced by the mold *Fusarium nivale* when grown at cool temperatures. The most abundant toxin is a butenolide characterized as 4-acetamido-4-hydroxy-2-butenic acid- ν -lactone (I). Isolation of I was guided by a rabbit-skin or

mouse bioassay. Also isolated were lesser amounts of a sesquiterpenoid (8-(3-methylbutyryloxy)-diacetoxyscirpenol). *F. nivale* was isolated from tall fescue hay toxic to cattle and may be implicated in such toxicity.

2305 • *Caltha palustris* L. Seed Oil. A Source of Four Fatty Acids with *cis*-5-Unsaturation

C.R. SMITH, JR., R. KLEIMAN, and I.A. WOLFF
Lipids 3(1): 37-42. January 1968

The seed oil of *Caltha palustris* L. yields two unusual polyunsaturated components, all-*cis*-5,11,14-eicosatrienoic acid (23%) and all-*cis*-5,11,14,17-eicosatetraenoic acid (1%). The C₁₈ monoene

fraction (26%) is a mixture of *cis*-5- and *cis*-9-octadecenoic acids (2:1). The C₂₀ monoene fraction (12%) is a mixture of *cis*-11- and *cis*-5-isomers (3:1).

2306 • A Method for Evaluating Deflocculants

T.A. McGUIRE, B.T. HOFREITER, C.L. MEHLTRETTER, and C.E. RIST
Tappi 51(2): 94-97. February 1968

A handsheet method has been devised for screening cereal starch products and other materials as deflocculants when applied as wet-end additives in papermaking. Tensile strength measurements on handsheets formed after two different holding times in the sheet mold provided data for calculating the portion of increase in tensile strength related to improved formation. A survey indicated that a

number of bifunctional starch products increased bond strength but had a negative effect on sheet formation. A series of microbiological polysaccharides prepared at the Northern Division showed deflocculating action similar to industrially used locust bean and guar gums. The method is useful for the rapid survey of materials as pulp deflocculating agents.

2307 • Effect of Some Pigments on Tensile and Swelling Properties of Linseed Oil Films

R.L. EISSLER and L.H. PRINCEN
J. Paint Technol. 40(518): 105-111. March 1968

Unsupported pigmented and unpigmented films were made from bodied M-37 and S-70 linseed oils. Pigmented films contained 30% total pigment-volume-concentration of ZnO , TiO_2 , or combinations of the two. Breaking strength and elongation at break were determined for all films. Swelling of unpigmented films was measured in a number of

liquids; of pigmented films, in water. The pH attained by water on standing in contact with each film was also determined. Major differences between film properties appeared to depend more upon pigments used than on differences between the two oils.

2308 • Effect of Disulfide-Bond Cleavage on Wheat Gliadin Fractions Obtained by Gel Filtration

HARALD C. NIELSEN, A.C. BECKWITH, and J.S. WALL
Cereal Chem. 45(1): 37-47. January 1968

Cleaving the disulfide bonds of the two fractions obtained from classical wheat gliadin by gel-filtration chromatography provides further evidence that structure and properties of these proteins differ. The higher molecular-weight fraction, present in small amount in classical gliadin, has properties of a low-molecular-weight glutenin and, therefore, is designated as such in this paper. The viscosity

of low-molecular-weight glutenin decreases drastically upon disulfide cleavage; also its molecular weight drops from about 125,000 to around 37,000. This decline indicates intermolecular disulfide bonds as in glutenin. Also, the starch-gel electrophoretic pattern of reduced and alkylated low-molecular-weight glutenin resembles that of glutenin more than it does of gliadin.

- 2309 • **Crambe Seed Processing. Improved Feed Meal by Soda Ash Treatment**
G.C. MUSTAKAS, L.D. KIRK, E.L. GRIFFIN, JR., and D.C. CLANTON¹
(¹North Platte Station, University of Nebraska, North Platte)
J. Amer. Oil Chem. Soc. 45(1): 53-57. January 1968

Crambe seed, like rapeseed, is characterized by having thioglucosides and perhaps other antigrowth factors that diminish feed value and palatability. A soda ash cooking process was developed that modifies the thioglucosides in crambe meal and significantly improves its feeding value.

Destruction of the undesirable thioglucoside fraction of the meal was demonstrated, not only by paper chromatographic changes, but also by negative results

in tests which were based on conversion of the thioglucoside to thiooxazolidone. Sodium carbonate, added at a level of 1.4% (whole seed basis), destroys both the goitrin precursor, *epi*-progoitrin thioglucoside, and the ultraviolet-absorbing compounds in the meal, at least one of which is associated with bitterness. Animal feeding tests demonstrated the improved palatability and nutritional quality of the meal.

- 2310 • **Ion-Exchange Chromatography of Nucleotides on Polyethyleneimine Cellulose Columns: Analysis of Maize Grain Extracts**
D.D. CHRISTIANSON, J.W. PAULIS, and J.S. WALL
Anal. Biochem. 22(1): 35-46. January 1968

A procedure has been developed for the quantitative chromatographic separation of free nucleotides isolated from maize grain extracts on columns of polyethyleneimine-microcrystalline cellulose. Use of a uniform microcrystalline cellulose provides sharper separations of nucleotides as compared with separations with standard fibrous celluloses. Mono- and diphosphate nucleotides and sugar nucleotides are eluted with a concave gradient elution system of LiCl and boric acid, in which ionic strength and pH are independently changed. Borate complexing facilitates both separation of sugar nucleotides from

their related diphosphate nucleotides and separation of deoxyribo- and ribonucleotides.

Phenolic materials and other plant constituents that interfere with the detection of nucleotides during chromatography are less readily absorbed on PEI-cellulose. Use of PEI-cellulose, therefore, permits direct analysis of some plant extracts without extensive preliminary purification, which may result in degradation and loss of nucleotides. Application of the method is illustrated by the analysis of free nucleotides contained in immature maize seeds.

- 2311 • **Transglucosyl-Amylase of *Candida tropicalis***
LAWRENCE K. NAKAMURA and KARL L. SMILEY
Appl. Microbiol. 16(2): 216-222. February 1968

Transglucosyl-amylase was purified 96-fold and partially characterized. The K_m value with dextrin as substrate was 9.1 mg./ml. Glycerol, an acceptor of α -glucose, appeared to inhibit dextrin hydrolysis noncompetitively. The energy of activation of the enzyme was 7,920 cal./mole. Indirect determinations showed that synthesis of α -glucosyl glycerol was significantly affected by the nature of the amylaceous substrate. Glucosyl-glycerol synthesis did not increase as incubation temperature

was raised from 50° to 60° C. Direct determinations by gas-liquid chromatography indicated that the synthesis of glucosyl glycerol, as a function of the concentration of either enzyme, substrate, or glycerol, traced a curvilinear path approaching about 15 mg./ml. as the maximum. When enzyme, substrate, and glycerol at high concentrations were varied in all possible combinations however, conditions for producing as much as 47.5 mg./ml. of glucosyl glycerol were established.

2312 • O-(Alkyl- and Aryl-Oxythiocarbonyl) Sugar Derivatives

B.S. SHASHA, W.M. DOANE, C.R. RUSSELL, and C.E. RIST
Carbohydr. Res. 6(1): 34-42. January 1968

Bis(1,2,5,6-di-O-isopropylidene-3-O-thiocarbonyl- α -D-glucofuranose) disulfide in pyridine undergoes a fragmentation reaction when treated with excess methyl, ethyl, propyl, or butyl alcohols, or phenol, to give the corresponding O-oxythiocarbonyl derivatives. A faster reaction and higher yield result when iodine is included in the pyridine solution. The oxythiocarbonyl compounds are stable when distilled (near 190° C.) under diminished pressure. Selective, acid hydrolysis of 3-O-(ethoxythiocarbonyl)-

1,2;5,6-di-O-isopropylidene- α -D-glucofuranose (III) gave 3-O-(ethoxythiocarbonyl)-1,2-O-isopropylidene- α -D-glucofuranose, which rearranged, on standing in triethylamine, to form 1,2-O-isopropylidene- α -D-glucofuranose 5,6-thionocarbonate. Oxidation of III with lead tetraacetate or silver nitrate gave the corresponding 3-O-ethoxycarbonyl derivative, whereas reduction of III with Raney nickel gave 3-O-(ethoxymethylene-1,2;5,6-di-O-isopropylidene- α -D-glucofuranose.

2313 • Preparation and Characterization of 1,2,6,2',3',4',6'-Hepta-O-Acetyl- β -Maltose

W.E. DICK, JR., B.G. BAKER, and J.E. HODGE
Carbohydr. Res. 6(1): 52-62. January 1968

Acetylation of a slurry of β -maltose monohydrate in cold toluene with acetyl-pyridinium chloride gave 1,2,6,2',3',4',6'-hepta-O-acetyl- β -maltose (I) in 70% yield, with octa-O-acetyl- β -maltose as the byproduct. Crystalline 3-O-methyl (II) and 3-O-phenylcarbamoyl (III) derivatives of I were readily obtained. A deacetylated sample of II yielded 3-O-methyl- α , β -D-glucose and α , β -D-glucose after aqueous hydrolysis. To discriminate between the O-3 and O-3' positions, a second portion of deacetylated II was reduced with sodium borohydride

and the product methanolized, to yield 3-O-methyl-D-glucitol and methyl α , β -D-glucopyranoside. Components of the methanolizate were identified by gas-liquid chromatography. Deacetylation and methanolysis of III gave methyl 3-O-phenylcarbamoyl- α , β -D-glucopyranoside (V), from which methyl 2,4,6-tri-O-benzoyl-3-O-phenylcarbamoyl- β -D-glucopyranoside (VI) was isolated crystalline; synthesis of VI from 1,2;5,6-di-O-isopropylidene- α -D-glucose proved its structure.

2314 • Influence of Swelling and Disruption of the Starch Granule on the Composition of the Starch-Polyacrylonitrile Copolymer

ROBERT C. BURR, GEORGE F. FANTA, C.R. RUSSELL, and C.E. RIST
J. Macromol. Sci., Part A, 1(7): 1381-1385. November 1967

The influence of swelling and disruption of the starch granule on the grafting frequency and molecular weight of grafted chains was studied for the ceric ammonium nitrate initiated graft polymerization of acrylonitrile with starch. High molecular-weight grafts (MW 800,000) at infrequent intervals resulted when starch was gelatinized at 85° C. before reaction. Granular starch afforded more frequent grafts of

lower molecular weight (MW 100,000). Starch swollen at 60° C. gave intermediate values. Complete disruption of the starch granule by solution in dimethyl sulfoxide, followed by precipitation with methanol, also gave intermediate values for molecular weights of grafted chains; however, a copolymer with greater solubility was obtained.

2315* • The Mechanism of Dispersion of Starch by Urea and by Guanidinium and Lithium Salts

STIG R. ERLANDER and R. TOBIN

Makromol. Chem. 107(2477): 204-221. August 1967

The ability of various aqueous salt solutions to disperse high-amylose corn starch (70% apparent amylose) was examined. The results were interpreted in light of a proposed theory concerning the structure and properties of hydrated ions and molecules. In those solutions where both cation and anion have negative hydration (possess only B-regions) such as guanidinium thiocyanate, the solubility of starch continues to increase to the saturation point of the salt. On the other hand, if the cation has positive while the anion has negative hydration, then the solubility of starch goes through a maximum (at 6 M LiBr or 6 M LiSCN). It is proposed that only the negatively hydrated domains of a salt disperse

starch. The negatively hydrated domains of an anion or cation disperse starch granules in one of two ways. If the effective dielectric constant of the ion is greater than that of water, then the dispersion occurs by swamping out the electrostatic forces involved in a hydrogen bond. If the effective dielectric constant of the negatively hydrated ion is less than that of water, then the ion can disperse starch granules only when it becomes unhydrated as in the case of 9 M LiCl. In other words, dispersion occurs by hydrating the hydroxyl groups to the ions. Such electrostatic interactions may be involved in some protein-polysaccharide complexes.

2316 • Sexual Agglutination in Yeast. VI. Role of Disulfide Bonds in 5-Agglutinin

NEIL W. TAYLOR, WILLIAM L. ORTON, and GLEN E. BABCOCK

Arch. Biochem. Biophys. 123(2): 265-270. February 1968

The sex-specific agglutinin from mating type 5 of *Hansenula wingei* contains six disulfide bonds per particle. It can be inactivated by disulfide-cleaving agents and converted to a mixture of two components having sedimentation rates of approximately 2 and 13 Svedbergs, compared with the original of $S_{25,W} = 13.1$. The 2S component makes up 9% and the 13S, 81% of the total material. On dialysis in pH 7.6 buffer,

the reduced products regain from 25 to 77% of the original agglutinative activity. After separation of the two reduced components by gel filtration, tests disclosed that activity was regained only when both components were dialyzed together. Evidently, 5-agglutinin contains a sensitive, interchain, disulfide bond system that unites several agglutinating elements in each particle with a large inert matrix.

2317 • Determination of Fat Composition

H.J. DUTTON

J. Amer. Oil Chem. Soc. 45(1): 4A, 6A, 8A, 44A-45A. January 1968

A revolution has taken place in the analysis of fats. Physical methods, both rapid and accurate, have replaced laborious chemical procedures. Time-honored saponification equivalents and iodine values now are calculated from chromatographic and nuclear magnetic resonance spectroscopic data. Differential migration processes, such as countercurrent distribution, liquid-liquid chromatography, and gas chromatography, have supplanted the classical distillation and crystallization procedures for analysis and preparation.

What once were "gadgets" are the stock-in-trade of the analytical lipid chemist. Mass, infrared, ultraviolet, and nuclear magnetic resonance spectrometers serve as accepted tools for organic characterization. Recording detectors and computer processing of data reduce the labor of analysis and improve its quantitation. Today's methodology stands at the verge of specifying fatty acid composition of even so complex lipids as hydrogenated fats in terms of the amounts, positions, and geometric configurations of the individual component fatty acids.

- 2318 • **New Crops. A List of Publications and Patents for 1967**
NORTH. UTIL. RES. DEVELOP. DIV.
U.S. Agr. Res. Serv., ARS-71-19-6, 4 pp. March 1968 [Processed]
- 2319 • **Publications and Patents of the Northern Utilization Research and Development Division, July-December 1967**
NORTH. UTIL. RES. DEVELOP. DIV.
U.S. Agr. Res. Serv., Unnumb. Pub., 39 pp. [January 1968]
- 2320 • **Preparation and Evaluation of Surface-Active Brassylic Acid-Ethylene Oxide Adducts**
THOMAS K. MIWA, RICHARD V. MADRIGAL, WILLIAM H. TALLENT, and IVAN A. WOLFF
J. Amer. Oil Chem. Soc. 45(3): 159-164. March 1968

Both liquid and solid surface-active adducts of brassylic (tridecanedioic) acid were prepared by potassium hydroxide-catalyzed addition of ethylene oxide gas to the molten acid. The number-average molecular weights ($\overline{MW}_n$) of the adducts ranged from 500 to 3,000. These adducts cover a wide span in the ratios of hydrophilic to lipophilic portions of the molecule. They are unique in that hydrophilic

end-groups sandwich a rather long chain of lipophilic methylene units. Treatment of some adducts with hot, saturated, aqueous sodium chloride induced transesterification and produced hydroxyl-terminated, multibrassylic, poly(ethylene glycol) esters of $\overline{MW}_n$ 1,000 to 4,000—all of which were efficient surface-active agents.

- 2321 • **Selective Hydrogenation of Soybean Oil. III. Copper-Exchanged Molecular Sieves and Other Supported Catalysts**
SAMBASIVARAO KORITALA
J. Amer. Oil Chem. Soc. 45(3): 197-200. March 1968

Copper-chromium catalysts promote selective reduction of linolenyl groups in soybean oil. Since commercially available catalysts possess only moderate activity, more active catalysts were sought. Copper was dispersed on high-surface-area supports, such as silica, alumina, and molecular sieves. These catalysts had varying activities. Precipitation of copper on fumed colloidal silica, having a large external surface area, gave the most active catalyst. Selectivity ratios (K'_{Le}/K_{Lo}) for the hydrogenation of soybean oil with these catalysts varied from 4 to 16; a copper-on-silica catalyst exhibited the greatest selectivity. Improved selectivity and activity were observed when some supports were treated with

hydrochloric acid. For example, a copper-on-diatomite catalyst hydrogenated soybean oil in 165 minutes and gave a selectivity ratio of 5.9. Hydrochloric acid treatment of diatomite improved selectivity to 9.9 and reduced hydrogenation time to 54 minutes. To ensure maximum activity of some of these catalysts, soybean oil should be more thoroughly bleached than is customarily done for nickel hydrogenation. A commercially refined and bleached soybean oil was hydrogenated with the copper-on-silica catalyst in 18 minutes. The same oil re-refined in the laboratory was reduced in 11.5 minutes and had the same selectivity ratio of 15.

2322* • Sensitivity of Bacterial Plant Pathogens to StreptomycinR.N. GOODMAN¹ and L.A. LINDENFELSER

(University of Missouri, Columbia)

In "Sourcebook of Laboratory Exercises in Plant Pathology," eds. Sourcebook Committee, Amer. Phytopatholog. Soc., Exercise 185, pp. 290-292. San Francisco, Calif. 1967

Both chemotherapeutants and antibiotics may be used to protect plants from certain diseases. Streptomycin, for example, has antibacterial activity against some plant pathogenic bacteria, which are

sensitive to this antibiotic in proportion to its concentration. Details are given for setting up laboratory tests to determine the sensitivity of selected plant pathogens to streptomycin.

2323* • Inhibition of Phytopathogenic Fungi by Antibiotics

L.A. LINDENFELSER

In "Sourcebook of Laboratory Exercises in Plant Pathology," eds. Sourcebook Committee, Amer. Phytopatholog. Soc., Exercise 192, pp. 301-303. San Francisco, Calif. 1967

Certain plant diseases caused by fungi may be effectively controlled by the use of antibiotics. Details are outlined for laboratory testing of a given antibiotic

to determine its minimum inhibitory concentration for selected disease-producing fungi.

2324 • Microbiological Research on Wheat and Flour

C.W. HESSELTINE

Proc. Symp. Infestation and Microbiological Control of Cereals and Cereal Products, sponsored by Central States Section, Amer. Ass. Cereal Chem., February 16-17, 1968, St. Louis, Mo., 24 pp., plus 2 figures. [Processed, 1968.]

This paper reviews research conducted at the Northern Division on the microbiology of flour. Two aspects are covered: The kinds and numbers of microorganisms in flour from various parts of the United States and the methods devised to reduce

the microbial count to below 5,000 per gram. Also given are details of the methods for counting the various microorganisms and their identification. References are listed to all papers published from the Northern Division covering these activities.

2325 • Utilization Research on Grain Sorghum in the USDA

JOSEPH S. WALL

Proc. 5th Grain Sorghum Research and Utilization Conf., sponsored by the Grain Sorghum Producers Ass. at Amarillo, Texas, pp. 21-25. March 2-3, 1967

Increased sorghum grain production in America and familiarity with sorghum in many of the developing countries have prompted the exploration of avenues to introduce more sorghum into domestic and overseas use. Some areas of fundamental studies on sorghum grain in the current program at the Northern Division include: separation and characterization of lipids,

differences in proteins and their amino acid composition, and structural studies of the kernel. Also, applied research on efficient removal of pericarp in dry milling sorghum and incorporation of sorghum into precooked blended products is aimed at producing better foods from sorghum.

2326* • New Linseed Oil Emulsion Coatings Show Promise

J.C. COWAN and L.H. PRINCEN

Proc. 37th Annual Flax Inst. U.S., Fargo, N. Dak., pp. 44-46. November 16-17, 1967

Cationic emulsion paints can be prepared that use emulsifiers in relatively small amounts. These cationic emulsifiers impart positive charges to the pigments, as well as to the oil droplets, and all the particles and droplets in the paint repel one another. Such an emulsion paint is stable in storage. These emulsions also dry rapidly and resist attack by water shortly after they are applied.

Cationic linseed oil emulsions can also be prepared that appear most suitable for coating concrete. By imparting a positive charge to the oil

droplets, the oil seems to coat more rapidly and to penetrate the surface of concrete better than available compositions. Greater protection from salt and freeze-thaw cycles should result. Tests are now being conducted to determine the effectiveness of these emulsions.

Finally, part of the oil in an emulsion paint can be used to coat the pigments and give glossier paints. This process also improves shelf stability of the paints.

2327* • The Transition from Helix to Coil at pH 12 for Amylose, Amylopectin, and Glycogen

STIG R. ERLANDER, R.M. PURVINAS, and H.L. GRIFFIN

Cereal Chem. 45(2): 140-153. March 1968

Previous studies have indicated that amylose undergoes a transition from the helix to the random coil conformation at pH 12. Such a transition produces a drop in intrinsic viscosity which corresponds to approximately 40% of the initial viscosity. To examine this phenomenon more fully, the viscosities of amylopectin, glycogen, and dextran, as well as that of amylose, were determined at pH 7 and 12. When sufficient salt is present, there is a drop of approximately 40% in intrinsic viscosity for amylopectin, glycogen, and amylose but not for the α -1,6-linked dextran. The helix therefore must also exist in amylopectin and glycogen, but not in dextran. It is concluded from this and other data that the stabilizing force for the helix must be hydrogen bonds between the C-2 and C'-3 hydroxyl groups of adjacent glucose units. In the absence of added salt, the value $[\eta]$ increases in going from pH 7 to 12.

This increase is caused by a stiffening of the chain due to electrostatic repulsion of the ionized hydroxyl groups of amylose. Addition of 32% methanol (theta solvent) to a 0.5 N NaOH solution reduces the value of $[\eta]$ for amylose to that obtained at pH 12. Hence, the reduction in $[\eta]$ at pH 12 in the presence of salt is not due to ion-binding or similar phenomena. Rather, this reduction in $[\eta]$ for both linear and branched α -1,4-linked polyglucosides is caused by elimination of electrostatic repulsion forces and by destruction of the helix. It is concluded that the helix of different molecules in the same medium may have a variable number of glucose units per helical turn (most likely seven to eight glucose units in water). This number may be fractional rather than integral, because the stability of the helix does not depend on hydrogen-bonding between helical rings.

- 2328 • Infection of *Popillia japonica* Larvae with Heat-Activated Spores of *Bacillus popilliae*
GRANT ST. JULIAN and HARLOW H. HALL
J. Invertebr. Pathol. 10(1): 48-53. January 1968

Maximum outgrowth of spores of *Bacillus popilliae* resulted after they were heated at 50° C., but outgrowth diminished as the temperature was increased to 80° C. Although outgrowth was limited and often variable, infectivity was predictably influenced by heat activation of spores. The greatest number of *Popillia japonica* larvae (92.6%) was infected by injection of one million spores per larva

heated at 50° C. By contrast, maximum infection from the same number of unheated spores was only 38.9%. Infectivity of spores heated at 60° C. and at 70° C. generally was intermediate between these values; heating at 80° C. afforded minimal infectivity. Apparently infectivity depends on the efficacy of spore outgrowth which, in turn, is influenced by appropriate heat treatment.

- 2329 • Thin-Layer Chromatography of Some Trimethylsilylated Carbohydrates
JACOB LEHRFELD
J. Chromatogr. 32(4): 685-691. February 1968

After thin-layer chromatography of some trimethylsilylated (TMS) carbohydrates was performed, their stability on silica gel plates was determined. Two mixtures were resolved on unactivated plates of silica gel: (1) TMS- α , β -D-glucose, methyl TMS- α -D-glucopyranoside, and

methyl TMS- β -D-glucopyranoside; and (2) TMS- α maltose, TMS- β -maltose, methyl TMS- β -maltoside, and methyl TMS- β -maltoside. To minimize the appearance of low R_f spots caused by partial degradation, the time between sample spotting and development was kept at a minimum.

- 2330* • The Diurnal Variation of Glycogen in Plants
STIG R. ERLANDER and JAMES P. McGUIRE
Staerke 19(12): 402-410. December 1967

Sweet corn kernels collected at various time intervals on the 13th and 26th day after pollination were placed immediately in hot 80% ethanol and then boiled for half an hour. Diurnal variations in yields of isolated glycogen and starch were studied. The yield of glycogen from the sweet corn endosperm goes through a maximum (at about 5:00 p.m. for the 13th day and 7:00 p.m. for the 26th day), whereas the yield of starch increases steadily without a maximum or minimum. These results agree with those obtained by others for the corresponding diurnal variations in corn leaves. The maximum yield of glycogen occurred at a time when starch was being produced at its most rapid rate. In other words, the rapid decrease in the yield of glycogen occurs at the same time that there is a corresponding rapid increase in the yield of starch. Moreover, the increase in the yield of glycogen occurs approximately 3 hours before there is a corresponding

increase in the yield of starch. Yet, both the decrease in the yield of starch and the increase in the yield of glycogen level off at the same time (about 11:00 p.m.). These studies on diurnal yields of starch and soluble polysaccharides suggest that a precursor glycogen is formed from sucrose and is then converted into a soluble amylopectin plus a soluble amylose. This soluble starch then forms insoluble starch granules. The last step may involve the formation of a complex with protein. Because of diurnal changes in yields of starch, the starch granules so formed will produce layers. The proposed debranching enzyme may be the branching enzyme under the proper conditions and with the proper cofactor or it may be the debranching enzyme of Manners and Rowe, or both. As shown by Griffin and Erlander it is not the "R-enzyme," which is a physical anomaly and therefore does not exist.

2331* • The Effect of Aqueous Salt Solutions on the Conformation and Thermal Motion of Molecules and Polymers Such as Starch

STIG R. ERLANDER and R. TOBIN

Makromol. Chem. 111(2623): 212-225. February 1968

The specific rotations $[\alpha]_D$ of various polysaccharides were examined in different salt solutions to determine their effect on conformation of the helix of amylose and amylopectin. The ability of anions and cations to decrease the value of $[\alpha]_{D,s}$ increases according to the sequences $\text{Cl}^- < \text{Br}^- < \text{SCN}^-$ and $\text{Li}^+ < \text{G}^+$. As expected, the largest decrease in $[\alpha]_{D,s}$ occurs in concentrated guanidinium thiocyanate (GSCN) solutions, on the basis of the ability of these ions to destroy the structure of water ($D_+ > D_1$ for G^+ and SCN^- ions). The reduction in $[\alpha]_{D,s}$ is similar to that resulting from an increase in the temperature of an aqueous amylose or amylopectin solution. The effect of the ions is, therefore, to reduce the number of water clusters and hydrogen bonds in general. As seen from a comparison of the dispersing power with a change in $[\alpha]_{D,s}$, the small change of -13 for $[\alpha]_{D,s}$ for the most effective solvent indicates that the helix is only partially destroyed in these salt solutions and that the major effect in decreasing the

value of $[\alpha]_{D,s}$ is the increase in the thermal or random motion of the polymer and its atoms. The greatest change in $[\alpha]_{D,s}$ in going from water to salt solutions occurs with the lower molecular weight species, such as glucose, methyl α -D-glucoside, and maltose, because these molecules are not so restricted in their random motions and therefore take a greater advantage of the increase in fluidity of the water. However, the sulfate ion in either MgSO_4 or G_2SO_4 gives the opposite effect for maltose and polyglucose but not for glucose or methyl α -D-glucoside. Apparently the sulfate ion stabilizes the hydrogen bond between C-2 and C'-3 hydroxyl groups and thereby decreases the random motion of the lower molecular weight species. The high value of D_+ for the Mg^{++} increases the change in $[\alpha]_{D,s}$ for glycogen. Light scattering and viscosity studies show that since these salt solutions do not degrade the starch even after 12 months, they must protect the polysaccharides from oxidation effects.

2332* • The Stability of the Helix of Amylose and Amylopectin in DMSO and Water Solutions

STIG R. ERLANDER and R. TOBIN

Makromol. Chem. 111(2622): 194-211. February 1968

A DMSO molecule behaves as a zwitterion having an electrostatic charge density on its oxygen atom comparable to that of a fluoride ion. Therefore the DMSO anion interacts with water to form an A-region having two water molecules; i.e., a $\text{DMSO} \cdot 2\text{H}_2\text{O}$ complex at 66% DMSO. Studies on amylose and amylopectin show that $\text{DMSO} \cdot 2\text{H}_2\text{O}$, as well as anhydrous DMSO, helps to stabilize the helix structure of amylose and amylopectin. Because this helix structure is absent in dextran and hydroxyethyl cellulose, their properties in DMSO/water solutions are different from those of starch. The model proposed for the interaction of DMSO or hydrated DMSO with the starch helix shows how these molecules stabilize the helix by interacting with only one hydroxyl group of the C-2 and C'-3 hydrogen-bonded hydroxyl groups. The α -helix of amylose and amylopectin is more stable at acid pH values of 90 and 100% DMSO solutions than alkaline values because of the formation of the $(\text{CH}_3)_2\text{S}^+-\text{OH}$ cation. The hydroxyl group of this cation salts-out the hydrogen bonds as do hydrated A-regions of Li^+ and Na^+ cations. Optical

rotation studies show that the addition of hydrated Na^+ ions also stabilizes the α -helix like a decrease in apparent pH. The greater stability of the helix in these DMSO solutions predicts that its average segment length will also increase. The decrease in the corrected specific rotation of amylose in going from water to DMSO solutions is most likely due to an increase in the thermal motion of the amylose rather than any decrease in the helix stability. The DMSO disperses starch because, unlike the hydrogen bonds in the helix, both of the hydroxyl groups involved in intermolecular hydrogen bonds can become complexed to DMSO anions. The lower pK of such intermolecular hydrogen bonds also allows alkali in DMSO to increase the dispersion power of DMSO. Salt (NaCl) decreases the dispersion power of DMSO because of the formation of interchain linkages through the unhydrated Cl^- ion. The $(\text{CH}_3)_2\text{S}^+-\text{OH}$ cation increases the dispersion power of DMSO by favoring the formation of those hydrogen bonds involved in the helix.

2333 • Penta-Acid Triglycerides of *Chamaepeuce afra* Seed Oil

K.L. MIKOLAJCZAK and C.R. SMITH, JR.

Biochim. Biophys. Acta 152(2): 244-254. March 1968

Earlier work in our Division demonstrated that chemical hydrolysis of *Chamaepeuce afra* (Jacq.) DC. seed oil yields a fatty acid mixture containing 14% (by weight) of (+)-*threo*-9,10,18-trihydroxyoctadec-*cis*-12-enoic acid and 9% of its saturated analog. The novelty of these acids prompted further work on the glyceride structure of this seed oil.

Two classes of unusual triglycerides (85% of the seed oil) have now been isolated and characterized. Each triglyceride class contains one free hydroxyl group as shown by infrared and thin-layer chromatographic data.

Castor bean (*Ricinus communis*) lipase hydrolysis of the glyceryl ester linkages of the triglycerides yields, in addition to ordinary C₁₆ and C₁₈ fatty acids, a trihydroxy acid moiety with two of the three hydroxyl groups acylated. In one triglyceride class, these acylating groups are C₁₂, C₁₆, and C₁₈ fatty acids; and in the second, C₁₆, C₁₈, and acetic acids. By chromium trioxide oxidation it was shown that the terminal hydroxyl group is acylated.

Pancreatic lipase (EC 3.1.1.3) hydrolysis revealed that these acylated trihydroxy acid residues were attached exclusively to the β -position of glycerol and that ordinary C₁₆ and C₁₈ acids occupied the α -positions.

2334 • Selection of Starch Derivatives for Emulsion Paints

B.G. BRAND,¹ D.A. BERRY,¹ W. MIRICK,¹ and C.L. MEHLTRETTER

(¹Battelle Memorial Institute, Columbus, Ohio)

J. Paint Technol. 40(519): 164-173. April 1968

A series of rapid screening tests for preliminary evaluation of candidate materials for emulsion paints is described and used successfully to reduce a group of 49 candidate samples of derivatized starches to six promising materials deemed worthy of further evaluation. The procedure is based on a determination of the mutual compatibility of the candidate material with other ingredients of the emulsion paint formula in which it is to be used.

Six derivatives were selected for evaluation in exterior and interior latex paints. The overall conclusion is that although many starch derivatives show little promise as resin replacements or diluents, certain starch derivatives may have promise as viscosity control agents.

2335* • The Polyelectrolyte Behavior of Amylose and its Helix-to-Coil Transition in Aqueous Alkaline Solutions
 STIG R. ERLANDER and R.M. PURVINAS
 Staerke 20(2): 37-45. February 1968

The helix-to-coil transition for amylose at pH 12 and its polyelectrolyte behavior in alkali (up to 5 M KOH) were investigated by measuring the intrinsic viscosity $[\eta]$ in alkali and the presence and absence of added salt. The values of $[\eta]$ decreased at pH 12 only if sufficient salt is present even though the helix has been destroyed. The change (increase or decrease) in $[\eta]$ at pH 12 thus depends on the amount of salt added. Similar increases or decreases occur in the values of the segment length of amylose. Consequently, at pH 12 electrostatic repulsive forces tend to expand the amylose, whereas in the absence of such forces (addition of salt) the amylose produces a smaller volume caused by the destruction of the helix. In the absence of salt, the Huggins viscosity constant ($k' = 0.77$ at pH 7 for $\bar{M}_w = 233,000$) goes through a minimum at 0.30 M KOH ($k' = 0.35$), a maximum at 0.88 M KOH ($k' = 1.18$), and finally begins to level off at

$k' = 0.35$ between 2.0 and 5.0 M KOH. Correspondingly, the values of $[\eta]$ first go through a maximum, then a minimum, and finally increase again. Apparently, the electrostatic charge on amylose goes through a minimum at 0.88 M KOH. A maximum negative charge on amylose occurs at 0.30 M KOH and at 2.0 to 5.0 M KOH. A comparison between NaOH and KOH solutions shows that the Na^+ ion produces these effects at lower molarities than the K^+ ion. Because the insolubility sequence for the R-O^- anion on amylose should be $\text{Li}^+ > \text{Na}^+ > \text{K}^+ > \text{Cs}^+$, it is concluded that reduction of charge after 0.3 M KOH is caused by an insolubilization of R-O^- rather than a reversal of charge phenomenon. Consequently, the increase in charge on amylose upon addition of alkali above 0.88 M KOH should result in a negative electrostatic charge rather than in a positive one.

2336 • Starch-Derived Polyol Glycosides. Properties and Potential Applications
 F.H. OTEY, C.L. MEHLTRETTER, and C.E. RIST
 Cereal Sci. Today 13(5): 199-201. May 1968

The reaction of starch with polyols, such as ethylene glycol or glycerol, yields mixtures of polyol glycosides that are low in cost and that have properties and applications comparable to those of more costly polyols. The applications include chemical starting materials for the preparation of urethane

foam, alkyds, and surfactants and for use as unmodified glycosides in humectants. Their unique properties, low cost, and variety of possible applications are expected to warrant commercial production of polyol glycosides for sale as aqueous solutions containing 70 to 80% solids.

2337 • A Precision Hydrogenator
 WILLIAM K. ROHWEDDER
 J. Catal. 10(1): 47-51. January 1968

A high-speed hydrogenation apparatus has been designed and built to give highly reproducible results. The 12-cc. reaction chamber has an enclosed top to prevent sample or catalyst from leaving the stirred region. The stirring paddle, which comes within 0.010 inch of the fluted walls of the reaction chamber,

is driven by a motor whose speed is controlled by a tachometer from 100 to 5,000 r.p.m. The pressure of the system is sensed by an electronic micromanometer and controlled by a stainless steel piston. An average deviation of 1.4% was found for the rate of hydrogenation of methyl oleate.

2338 • Automatic Integration and Computation of Amino Acid Analyses

JAMES F. CAVINS and MENDEL FRIEDMAN

Cereal Chem. 45(2): 172-176. March 1968

A versatile computer program has been developed for calculating amino acid analysis data. Peaks are identified by visual observation of chromatograms. The calculation was completely automated by recording the photometer output on a magnetic tape which is played back into an electronic integrator to produce a punched paper tape. The punched tape can be either fed directly to a computer or converted to punched cards. Calculations with the automatic system have

been performed with data from a variety of hydrolyzates, including pure proteins, chemically modified proteins, and feed meals. The computer program can be used with different interphase equipment. Computer output prints the results in several forms suitable for a variety of needs. Computation time is reduced more than 90% as compared to manual procedures.

2339 • Laboratory Optimization of Process Variables in Reductive Ozonolysis of Methyl Soyate

P.E. THROCKMORTON,¹ L.I. HANSEN,¹ R.C. CHRISTENSON,¹ and E.H. PRYDE
(¹Ashland Chemicals, Minneapolis, Minn.)

J. Amer. Oil Chem. Soc. 45(2): 59-62. February 1968

The laboratory experiments for reductive ozonolysis of methyl soyate were divided into four statistically designed groups, according to ozonolysis medium (methanol or water) and ozone carrier gas (oxygen or air). Each group comprised 27 separate experiments, each a one-third replicate of a 3⁴ factorial. Significant independent variables were determined by a preliminary set of experiments. Besides ozonolysis medium (X) and carrier gas (Y), the following significant independent variables were studied: medium/ester ratio (A), reduction catalyst (B), reduction pressure by hydrogen (C), and reduction temperature (D).

By gas-liquid partition chromatography of the dimethyl acetals of the two products, which included

methyl azelaaldehyde (MAZDA) and pelargonic aldehyde (PDA), aldehyde yields were determined for each experiment in the statistical groups.

Analysis of variance of the data (F-test) showed the following main effects and interactions for yield of MAZDA where oxygen carrier gas, water as the ozonolysis medium, and palladium-on-carbon catalyst were used for reduction: Y, YA, YB, YD, AD, BD, and AC. Data fit (regression analysis) provided regression equations. Computer solution of these equations indicated optimum process levels. Based on these optimum levels, the predicted overall yield of MAZDA is 89% of theoretical.

2340 • Aflatoxin Detoxification: Hydroxydihydro-Aflatoxin B₁

A. CIEGLER and R.E. PETERSON

Appl. Microbiol. 16(4): 665-666. April 1968

A large number of microorganisms were screened in shaken-flask culture for their ability to detoxify the fungal toxin, aflatoxin B₁. We noted formation of fluorescing compound with concomitant disappearance of aflatoxin B₁ when aflatoxin was added to acid-

producing mold cultures. Because the new compound appeared to be produced only in acidic media, we reproduced the reaction by adding aflatoxin B₁ to 0.1 N citric acid. The new compound was extracted and identified as hydroxydihydro-aflatoxin B₁.

2341* • Study OK's Kenaf's Potential for Paper

DWIGHT L. MILLER

Pulp & Paper 42(8): 59-60. February 1968

Under USDA's new crops program is the screening for new fiber crops as raw materials for the production of paper and paperboard. The Northern Division has evaluated more than 1,200 samples of fibrous plants from about 400 species. Kenaf may be the best. At least it is among the most promising new crops for pulping in the United States.

Kenaf annual fiber yields per acre are several times those of wood. Kenaf produces pulps with properties and performance equal to most softwoods and superior to most hardwoods. It is easier to pulp than wood. Kenaf papers have desirable and distinctive characteristics difficult to achieve with wood.

2342 • Flavor Aspects of Cereal-Oilseed-Based Food Products

G.E. INGLET, C.W. BLESSIN, and G.N. BOOKWALTER

Food Prod. Develop. 2(2): 66-67, 74. April-May 1968

Greater supplies of cereals and oilseeds for domestic and foreign food are going to be needed in the future. As new and more nutritive varieties of cereals, such as high-lysine corn, become agronomically acceptable and commercially available, we will depend on these even more, not only as a source of food and feed energy, but as a protein source. Currently, new cereal-oilseed-based foods are being prepared to give maximum nutrition at minimum cost primarily for use in the developing countries.

In these food products, cereals are supplemented with protein sources including soybean, cottonseed, peanut, and others to give a higher protein level and improve the proportions of essential amino acids available. Greater knowledge of composition, properties, and quality of cereals and oilseeds is needed to evaluate better these materials for new food products. Information also must be obtained on palatability, including flavor and texture.

2343 • Evaluation of Amounts and Pattern of Essential Amino Acids in Plant SeedsW.F. KWOLEK¹ and C.H. VanETTEN(¹USDA Biometrical Serv., Peoria, Ill.)

J. Agr. Food Chem. 16(3): 496-499. May-June 1968

The patterns for eight essential amino acids from 433 plant species are compared to the standard FAO/WHO pattern for hen's egg. The comparison procedure described is based on the average amount of essential amino acid in the total crude protein of the seed and on variation of the essential amino acid pattern from a standard. For the species assayed, differences between the families Cruciferae,

Leguminosae, Compositae, and Gramineae are evident. Listed are 20 species with essential amino acid patterns closest to hen's egg. Generally, members of the Compositae and Umbelliferae have the "best" pattern. A method is also presented for calculating optimum combinations of two or more protein sources.

- 2344 • Factors in Oats That Could Be Mistaken for Aflatoxin**
ODETTE L. SHOTWELL, GAIL M. SHANNON, MARION L. GOULDEN,
MELBA S. MILBURN, and HARLOW H. HALL
Cereal Chem. 45(3): 236-241. May 1968

In an examination of oat samples, initial chemical tests indicated that many of those tested contained fluorescing substances which behaved like aflatoxins B₁ and G₁ on thin-layer chromatographic plates. When these same samples were assayed in ducklings, symptoms typical of those caused by aflatoxin failed to develop. Several methods of purification, including solvent distribution, chromatography on silica gel, and lead acetate precipitation, failed to remove interfering substances. Analyses of groats and hulls of oats separately revealed that the fluorescing

substances occur in the hulls. Aflatoxins B₁ and G₁ can be most conveniently differentiated from oat factors on thin-layer plates made of a specific silica gel and developed with 5 or 7% methanol in chloroform. Extracts of oats were purified on thin-layer plates and then treated with trifluoroacetic acid and with formic and acetic acids in the presence of thionyl chloride in an attempt to prepare derivatives. Thin-layer chromatograms of treated extracts showed that products formed were not similar to those obtained when aflatoxins were treated with the same reagents.

- 2345 • Gliadin Proteins from Different Varieties of Wheats**
F.R. HUEBNER and J.A. ROTHFUS
Cereal Chem. 45(3): 242-253. May 1968

Protein compositions of gliadin fractions from several varieties of common, durum, and club wheats were compared by column chromatography on sulfoethyl cellulose and by starch-gel electrophoresis. Compositional differences among the wheats studied were greatest between varieties representing different classes and least between varieties of the same class. Two hard red winter wheats, Red Chief, a poor baking quality wheat, and Comanche, a good quality wheat, showed only a few significant differences. All varieties analyzed contained proteins analogous to the γ_1 -gliadin of Comanche. In addition, several other components from different classes of wheat had nearly identical chromatographic and electrophoretic

properties. Compared to gliadin from Comanche (*Triticum aestivum*, ssp. *vulgare*), the gliadin of Omar, a club wheat (*T. aestivum*, ssp. *compactum*), contained a larger number of β -gliadins and fewer α -gliadins, whereas gliadin from Lakota, a durum wheat (*T. durum*), differed primarily by having at least three additional γ -gliadinlike components. Differences among varieties in the quantitative distribution of proteins were also noted. Amino acid analysis of isolated components from different varieties showed that γ_1 -gliadins have nearly identical amino acid composition. A γ -gliadin from Lakota and γ_3 -gliadin from Red Chief also have nearly the same amino acid content.

- 2346 • Glyceride Structure of *Cardamine impatiens* L. Seed Oil**
K.L. MIKOLAJCZAK, C.R. SMITH, JR., and I.A. WOLFF
Lipids 3(3): 215-220. May 1968

A group of unusual triglycerides, in which one of the acyl groups is a vicinal dihydroxy acid with one of the hydroxyl groups acetylated, has been isolated from *Cardamine impatiens* L. (Cruciferae) seed oil. Hydrolysis of these triglycerides with castor bean lipase facilitated isolation and identification of intact C₁₈, C₂₀, C₂₂, and C₂₄ hydroxy acetoxyl fatty acids.

Pancreatic lipase hydrolysis data revealed that these monoacetylated dihydroxy acid residues are esterified exclusively with one of the α -positions of the glycerol moiety. The remaining acyl groups are comprised of ordinary C₁₈ unsaturated acids (which occupy 98% of the β -position), palmitic acid, and C₂₀, C₂₂, and C₂₄ monoenoic fatty acids.

- 2347 • 1,2-Cycloaddition of Haloalkenes to Conjugated Fatty Esters**
E.W. BELL, J.P. FRIEDRICH, L.E. GAST, and J.C. COWAN
J. Amer. Oil Chem. Soc. 45(5): 388-392. May 1968

We have studied the reaction of 1,1-dichloro-2,2-difluoro-, chlorotrifluoro-, and tetrafluoroethylenes and also hexafluoropropylene with *cis,trans* and *trans,trans* isomers of conjugated methyl octadecadienoate. Reactions gave 50 to 82% yields of cycloaddition products. The preponderance of products with a cyclobutane structure and a double bond α, β to the cyclobutane ring was shown by IR and NMR

spectra. Reactions were carried out in diluent with hydroquinone inhibitor at autogenous pressure and a temperature of 200° C. for 5 hours. The distilled adducts are colorless liquids with viscosities ranging from 11 to 19 centistokes at 100° F. These products and their hydrogenated derivatives exhibit low pour-points (down to -76° F.) and may be useful as low-temperature plasticizers or lubricant additives.

- 2348 • Specific Modification of Protein Sulfhydryl Groups with α, β -Unsaturated Compounds**
JAMES F. CAVINS and MENDEL FRIEDMAN
J. Biol. Chem. 243(12): 3357-3360. June 1968

Reaction rates with acrylic acid derivatives were determined for -SH groups in mercaptoethanol and in mercaptoethanol-reduced wheat gluten and bovine serum albumin. The disappearance of -SH and NH₂ groups is a direct function of pH in the range 6 to 8 and of acrylate concentration. Kinetic studies indicate that protein -SH groups are modified more rapidly

than the mercaptoethanol -SH group. Conditions for specific alkylation of protein -SH groups are pH 7 and a 1:1 ratio of vinyl compound to total protein and mercaptoethanol -SH groups. Under these conditions, the reaction is complete in 5 minutes with methyl acrylate, 15 minutes with acrylonitrile, and 60 minutes with acrylamide.

- 2349 • Alkali Sorption and Swelling of Starch**
E.B. LANCASTER and H.F. CONWAY
Cereal Sci. Today 13(6): 248-250. June 1968

Sorption of sodium hydroxide by starch is described in terms of the parameters of a family of Freundlich isotherms. Swelling is investigated by means of a filtration test and by viscometric measure-

ment, and related to the amount of alkali sorbed. A figure for estimating the conditions that cause swelling is given.

- 2350 • Enantiomeric 3-Hydroxypent-4-Enethionamides from Thioglucosides of Crambe and Brassica Seeds by Action of Ferrous Salts**
F.L. AUSTIN, C.A. GENT, and I.A. WOLFF
Can. J. Chem. 46(9): 1507-1512. May 1968

epi-Progoitrin, the major thioglucoside of *Crambe abyssinica* seed, is cleaved by ferrous salts to yield (S)-1-cyano-2-hydroxy-3-butene and (S)-3-hydroxypent-4-enethionamide. The products are the same whether from the purified thioglucoside or from the seed meal. Identical behavior was observed for seed

meal of *Brassica napus*, which gave corresponding derivatives of the opposite configuration. Optical rotatory dispersion and proton magnetic resonance studies suggest the existence of solvent-dependent differences in rotamer composition for the 3-hydroxypent-4-enethionamides.

- 2351 • **Homogeneous Hydrogenation of Unsaturated Fatty Esters by $\text{Fe}(\text{CO})_5$ and Diene- $\text{Fe}(\text{CO})_3$**
E.N. FRANKEL, T.L. MOUNTS, R.O. BUTTERFIELD, and H.J. DUTTON
Advan. Chem. Ser. 70: 177-194. 1968

The mechanism of homogeneous hydrogenation and isomerization catalyzed by $\text{Fe}(\text{CO})_5$ was studied with mixtures of unsaturated fatty esters containing a radioactive label. Although pure monoenes were readily hydrogenated and isomerized with $\text{Fe}(\text{CO})_5$, in a mixture of conjugatable 1,4-diene and monoene, diene hydrogenation dominated. The formation of diene- $\text{Fe}(\text{CO})_3$ apparently competes with and largely inhibits monoene hydrogenation. Studies with mixtures

of methyl linoleate and free or complexed conjugated dienes showed that diene- $\text{Fe}(\text{CO})_3$ complex is an essential intermediate in the catalysis by $\text{Fe}(\text{CO})_5$. Ligand exchange occurred between linoleate and diene- $\text{Fe}(\text{CO})_3$ and was accelerated by adding free $\text{Fe}(\text{CO})_5$. A direct reduction path from linoleate to monoene was a feature of the catalysis by diene- $\text{Fe}(\text{CO})_3$ alone.

- 2352 • **Composition of Oilseeds. A List of Publications for 1967**
NORTH. UTIL. RES. DEVELOP. DIV.
U.S. Agr. Res. Serv., ARS-71-23-6, 5 pp. May 1968. [Processed]

- 2353 • **Processing Oilseeds, Oil, and Meal. A List of Publications for 1967**
NORTH. UTIL. RES. DEVELOP. DIV.
U.S. Agr. Res. Serv., ARS-71-24-6, 3 pp. May 1968. [Processed]

- 2354 • **Edible Soybean Oil. A List of Publications and Patents for 1967**
NORTH. UTIL. RES. DEVELOP. DIV.
U.S. Agr. Res. Serv., ARS-71-25-6, 6 pp. May 1968. [Processed]

- 2355 • **Edible Soybean Protein Products. A List of Publications and Patents for 1967**
NORTH. UTIL. RES. DEVELOP. DIV.
U.S. Agr. Res. Serv., ARS-71-26-6, 3 pp. May 1968. [Processed]

- 2356 • **Chemically Modified Oil Products and Industrial Uses. A List of Publications and Patents for 1967**
NORTH. UTIL. RES. DEVELOP. DIV.
U.S. Agr. Res. Serv., ARS-71-27-6, 5 pp. May 1968. [Processed]

- 2357 • **Industrial Uses of Protein. A List of Publications and Patents for 1967**
NORTH. UTIL. RES. DEVELOP. DIV.
U.S. Agr. Res. Serv., ARS-71-28-5, 1 p. May 1968. [Processed]
- 2358 • **Review Articles on Oilseed Crops Research. A List of Publications for 1967**
NORTH. UTIL. RES. DEVELOP. DIV.
U.S. Agr. Res. Serv., ARS-71-29-6, 2 pp. May 1968. [Processed]
- 2359* • **Current Grain Sorghum Research**
C.W. BLESSIN, R.A. ANDERSON, and G.E. INGLETT
Sorghum Newsletter 11: 23-25. 1968

The current research program on grain sorghum at the Northern Division covers a number of areas of interest to sorghum investigators. Among them are isolation and compositional studies of sorghum proteins, distribution and composition of lipids, and wet- and dry-milling studies. Also, a new sorghum

monograph is being edited. Chapters on breeding, agronomy, composition, animal nutrition, milling, marketing, and other aspects of sorghum research are being prepared by authorities in Federal agencies, universities, and industry.

- 2360 • **Nylon 1313**
[H.J. NIESCHLAG, W.H. TALLENT, and I.A. WOLFF]
NORTH. UTIL. RES. DEVELOP. DIV.
U.S. Agr. Res. Serv., CA-71-28, 5 pp. June 1968. [Processed]

Nylon 1313 is a new polyamide that contains repeating monomer units with longer polymethylene chains than in nylons commonly available. It is readily made by conventional melt polymerization from monomers that can be derived in good yield

from erucic acid, the major fatty acid in the seed oil of crambe. The nature of polyamide, its preparation, processing conditions, properties, chemical resistance, and potential uses are described.

- 2361 • **Viability in Fertile Stocks of *Pseudomonas aeruginosa***
ALBERTA I. HERMAN and PATRICIA S. GRIFFIN
J. Bacteriol. 95(5): 1758-1763. May 1968

Diluent composition, time consumed in experimental manipulations, and the presence of pyocine-like lethal agents affected the viability of sexual fertility factor-positive and fertility factor-negative auxotrophic stocks of *Pseudomonas aeruginosa*. In the same cultures, recovery of prototrophic revertants increased as the number of viable cells dispensed

per plate was reduced. As a result, the number of revertants recovered was indirectly determined by the combined activities of the three conditions affecting viability. Possible modifications by these conditions affecting viability on the expression and interpretation of the fertility factor-positive sex factor-mediated system of genetic recombination are presented.

- 2362* • A Physical Study of the Degradation of Periodate-Oxidized Amylopectin**
 STIG R. ERLANDER and H.L. GRIFFIN
Staerke 19(5): 134-138. May 1967

The degradation of dent corn amylopectin molecules after periodate oxidation at pH 3.0 was followed by light scattering the oxidized amylopectin in 4.2 M guanidinium chloride (GHC1). Sedimentation studies of 80% periodate-oxidized amylose in 4.2 M GHC1 show that aggregation of the oxidized amylose molecules is destroyed by the guanidinium ions. Moreover, light-scattering studies on the oxidized amylose illustrate that the formation of aggregates of oxidized amylose molecules is reversible in going from water solutions to concentrated GHC1 solutions and then back to water solutions by removal of the guanidinium ion by dialysis. The aggregation of oxidized amylopectin or amylose in water at room

temperature, is, therefore, not a chemical reaction but rather a physical aggregation involving hydrogen bonds between the oxidized chains. Rate constants for the hydroxyl ion-catalyzed degradation of periodate-oxidized amylopectin molecules in 4.2 M GHC1 were then plotted versus the degree of periodate oxidation to the first, second, or third power. Results on oxidized amylopectin agree with those for oxidized amylose; namely, that the degradation of the oxidized amylopectin or oxidized amylose depends on the breakdown of two adjacent oxidized glucose units. In other words, the hydroxyl ion degradation of oxidized glucose units in starch is most rapid when two or more oxidized glucose units are adjacent.

- 2363 • Preliminary Report on Skid Resistance of Linseed Oil-Coated Concrete**
 W.L. KUBIE, L.E. GAST, and J.C. COWAN
In "Surface Properties of Pavements and Vehicle Interaction,"
Highway Res. Rec. No. 214, pp. 42-49. Washington, D.C. 1968

Linseed oil solutions and emulsions can be applied to new, old, or previously oiled concrete, and a rapid recovery of original skid-resistance values can be achieved. In a number of tests, dry skid-resistance values were restored within 3 hours. At a low temperature of 40° F., recovery is delayed to sometime between 3 and 19 hours. Wet skid-resistance values on test bridges usually recovered to original values within 3 to 24 hours.

Longer recovery times were encountered with wet skid resistances under certain conditions, such as low temperatures and no traffic. Since it is possible for a variety of reasons to apply too much

oil, highway officials need to consider precautionary measures to reduce hazards. If the road needs to be opened to traffic as soon as possible, certain factors need to be considered before oiling: the amount of oil to be applied; the extent and nature of the area to be coated; temperature of the road; the event of rain; and the age, finish, and previous coatings given to the concrete. Procedures that transfer oil from a coated area speed the return of skid-resistance values to original values. A test to determine capacity of concrete to absorb linseed oil compounds is needed.

- 2364 • Flour and Wheat: Research on Their Microbiological Flora**
 C.W. HESSELTINE
Baker's Dig. 42(3): 40-42, 66. June 1968

This study of the microbiology of flour was made to determine the range of counts of microorganisms in flour; the types of bacteria, yeasts, and molds present; the forms encountered in wet dough products; and methods to reduce the microbial counts in flour. The research was divided into two areas. The first involved the development of suitable selective culture media for counting the general bacterial and fungal populations and for enumerating the occurrence and numbers of special groups of microorganisms in flour. These questions needed answers: The normal

counts in wet dough products from flours and also the counts and kinds of microorganisms involved in their spoilage; the numbers of microorganisms present in flour from various mills scattered throughout the United States; and the species of microorganisms present.

The second area of the project involved the investigation of various chemical and physical methods and combinations of these which could be used to reduce the microbial count and still retain all the desirable properties of flour.

2365 • Induction and Propagation of a *Bacillus subtilis* L Form in Natural and Synthetic Media

H.R. BURMEISTER and C.W. HESSELTINE

J. Bacteriol. 95(5): 1857-1861. May 1968

The L form of *Bacillus subtilis* NRRL B-3275 was induced in a 7% NaCl broth medium and subsequently propagated in natural and synthetic media. The L form grows readily in tryptone broth supplemented with glucose, NaCl, and phosphate buffer, and in a synthetic medium containing only glucose and biotin, in addition to the required salts. Successive transfers from the bacillus inoculum and subsequent

large bodies in the tryptone broth with 7% NaCl resulted in gradual selection or transition from the bacillary form to a stable L form without the addition of an antibiotic. The number of viable granules attained in broth culture exceeded 9×10^7 per ml., and numerous large bodies were always present in rapidly growing cultures.

2366 • Free Radical Addition of Hydrogen Sulfide and Thiols to Linseed Oil and Methyl Oleate

A.W. SCHWAB, L.E. GAST, and J.C. COWAN

J. Amer. Oil Chem. Soc. 45(6): 461-464. June 1968

Free radical additions of hydrogen sulfide, ethanedithiol, and 1,6-hexanedithiol have been made to methyl oleate and linseed oil with ultraviolet radiation. Reactions were carried out in dichloromethane at -70°C . and in benzene at 25°C . With the dithiols, a new dibasic ester has been prepared from methyl oleate in which bridging is accomplished through a dithiol moiety. Hydrogen sulfide has been added to linseed oil in suitable solvents at both -70°C . and 25°C . It appears that zero-order kinetics control the additions at both temperatures. Infrared data show a linear relationship between mercapto absorption and the amount of sulfur incorporated. Nuclear

magnetic resonance (NMR) spectra demonstrate a decrease in olefinic protons with an increase in sulfur content. Fair agreement on the extent of reaction exists between data from NMR, sulfur content, and infrared analyses. Hydrogen sulfide-treated linseed oil films air-dry slowly at room temperature; at 250°C . for 1 hour under a CO_2 atmosphere these oils cure to brown films with Sward rocker values of 24 to 32 and pencil hardness values of 5 to greater than 6. Pencil hardness and alkali resistance increased with sulfur content. The film from the 4.2% sulfur sample resisted alkali at room temperature for 24 hours.

2367 • Starch in Rubber. Zinc Starch Xanthate in Latex Masterbatching

R.A. BUCHANAN, O.E. WEISLOGEL, C.R. RUSSELL, and C.E. RIST

Ind. Eng. Chem., Prod. Res. Develop. 7(2): 155-158. June 1968

Starch xanthate was evaluated as a modifier of latex coagulation, a rubber reinforcing agent, and an accelerator of vulcanization. Mixtures of starch xanthate with degree of substitution 0.07 and elastomer latices were coprecipitated with zinc sulfate. The coprecipitated curd, from mixtures containing more than 6 parts starch xanthate per 100 parts of rubber (phr), had as its continuous phase the insoluble zinc starch xanthate. The curd was easily dewatered and dried. Milling of dried coprecipitate reversed starch and rubber phases and gave a uniform dispersion of

fine particles of starch xanthate in the rubber. The zinc starch xanthate in these masterbatches accelerated sulfur vulcanization in proportion to the level of incorporation. Tensile properties of vulcanizates showed that zinc starch xanthate served as a reinforcing agent for a variety of elastomers. It was comparable to SRF black in reinforcing natural rubber and SBR up to 25 phr loading. In nitrile rubber it was comparable to HAF black up to 25 phr loading.

- 2368 • **Bis(1,2:5,6-di-O-isopropylidene-3-O-thiocarbonyl- α -D-glucofuranose) Disulfide**
B.S. SHASHA, W.M. DOANE, C.R. RUSSELL, and C.E. RIST
Carbohydr. Res. 7(1): 99-100. May 1968

A rapid method is reported for the quantitative preparation of bis(1,2:5,6-di-O-isopropylidene-3-O-

thiocarbonyl- α -D-glucofuranose) disulfide from 1,2:5,6-di-O-isopropylidene- α -D-glucofuranose.

- 2369 • **Viability of Fungus Cultures Preserved by Lyophilization**
J.J. ELLIS and JANE A. ROBERSON
Mycologia 60(2): 399-405. March-April 1968

Lyophilized ampules of 447 strains of fungi, mostly *Aspergilli* and *Penicillia*, were checked for viability. Many of the ampules had been processed 23 years previously. All strains sporulated in cultures made from lyophil preparations as well as,

or better than, in agar slant cultures that had been periodically transferred many times. It was necessary to open a second lyophil ampule for only 11 strains to obtain viable cultures.

- 2370 • **Copolymers of Wheat Starch and Polyacrylonitrile. Effect of Aqueous-Organic Solvent Systems on Copolymer Composition**
ROBERT C. BURR, GEORGE F. FANTA, C.R. RUSSELL, and C.E. RIST
J. Macromol. Sci., Part A2(1): 93-101. January 1968

Starch-polyacrylonitrile graft copolymers prepared in a number of aqueous-organic solvent systems with ceric ammonium nitrate as the initiator had more grafted chains than those prepared in water alone, and these were of lower molecular weight. Substitution of methanol for 80% of the water produced

grafted chains with a molecular weight of 15,700 and a grafting frequency of 253 anhydroglucose units per graft. Effects of catalyst concentration, increased reaction temperature, and sodium sulfate on the composition of the copolymer were investigated for the methanol-water system.

- 2371* • **Hemolymph Proteins of Healthy and Diseased Larvae of the Japanese Beetle, *Popillia japonica***
GLENN A. BENNETT, ODETTE L. SHOTWELL, HARLOW H. HALL, and WALTER R. HEARN¹
(¹Iowa State University, Ames)
J. Invertebr. Pathol. 11(1): 112-118. June 1968

Proteins in the hemolymph of *Popillia japonica* larvae were separated and characterized by molecular-sieve chromatography, starch-gel and cellulose polyacetate zone electrophoresis, and ultracentrifugation. Hemolymph samples from normal larvae and from larvae infected with *Bacillus popilliae*, the milky disease organism, were compared to determine the effect of the disease on the proteins. During the course of milky disease, one protein

disappeared and a smaller particle increased markedly in concentration. The protein present in highest concentration (major) exhibited the highest electrophoretic mobility and had an apparent isoelectric point of 5.85. This protein contained lipid as well as carbohydrate moieties. Hemolymph from diseased larvae showed a decrease in concentration of the major protein.

2372 • Double Bond Migration, Geometric Isomerization, and Deuterium Distribution During Heterogeneous Catalytic Deuteration of Methyl Oleate

H.J. DUTTON, C.R. SCHOLFIELD, E. SELKE, and W.K. ROHWEDDER

J. Catal. 10(4): 316-327. April 1968

Methyl *cis*-9-octadecenoate was deuterated over platinum and palladium catalysts. Saturates as well as *cis*- and *trans*-octadecenoates were separated for subsequent oxidative cleavage, gas chromatography, and mass spectrometry. The observed migration and geometric isomerization of double bonds, the distri-

bution of deuterium along the carbon chain, and the presence of hydrogen and also deuterium on the catalyst surface are collated by an extension of the Horiuti-Polanyi mechanism. These reactions were simulated by digital computer calculations of the proposed model.

2373 • Methylation of the Cellular Lipid of Methionine-Requiring *Agrobacterium tumefaciens*

TSUNEO KANESHIRO

J. Bacteriol. 95(6): 2078-2082. June 1968

Mutants of *Agrobacterium tumefaciens* requiring methionine for growth on a solid basal medium were induced by the use of *N*-methyl-*N'*-nitro-*N*-nitro-soguanidine. In addition to the difference of mutant strains, the extent of methionine dependency differed in a liquid basal medium and in the presence of aspartate or fumarate. When (¹⁴C-methyl)-methionine was added to strain WM-11 growing in a prescribed

basal medium, incorporation of ¹⁴C into the cellular "residue" fraction and polar "N-methylated" lipid fraction depended strictly on cellular growth and on external methionine concentration. However, a net synthesis of the "cyclopropane" fatty acid fraction occurred even during the maximal stationary phase if excess methionine was present.

2374 • Diastereomeric Episulfides from *epi*-Progoitrin Upon Autolysis of Crambe Seed Meal

M.E. DAXENBICHLER, C.H. VanETTEN, and I.A. WOLFF

Phytochemistry 7(6): 989-996. June 1968

When defatted seed meal from *Crambe abyssinica* Hochst ex R. E. Fries is autolyzed, its major thioglucoside, *epi*-progoitrin, undergoes a reaction sequence different from that which occurs upon enzymic hydrolysis of the thioglucoside in an isolated system. The major products are two diastereomeric (2*S*)-1-cyano-2-hydroxy-3,4-epithiobutanes, plus the previously characterized (*S*)-1-cyano-2-hydroxy-3-butene. The isomeric episulfides were structurally characterized primarily through their more stable monoacetyl derivatives. Relationship of the episulfides to (*S*)-1-cyano-2-hydroxy-3-butene, including config-

uration of the chiral center at carbon 2, was established by desulfurization of the acetate of each isomer with triphenylphosphine to give from both the acetate of (*S*)-1-cyano-2-hydroxy-3-butene. Configurations at the chiral center at carbon 3 have not been established. Formation of these episulfides is most likely due to a nonenzymic reaction that follows initial enzymic formation of a suitable intermediate from *epi*-progoitrin. The diastereomeric episulfides were separated from each other on a column of modified dextran designed for use as a molecular sieve.

CONTRACT AND GRANT RESEARCH PUBLICATIONS

[Report of research work done by an outside agency under contract with the U.S. Department of Agriculture and supervised by the Northern Utilization Research and Development Division.]

- 187-C* ● **Fungistatic Protection for Oil and Latex Based Paints Is Enhanced by Certain Mercury Derivatives of . . .**
A.E. RHEINECK, S.N. KOLEY, and J.L. PARSONS
North Dakota State University, Fargo
Paint Varn. Prod. 57(11): 34-39. November 1967
- 189-C ● **Methyl 4,6-O-Benzylidene-O-Ethyl- and -O-Vinyl- α -D-Glucopyranosides**
J.T. MARVEL, S.K. SEN, F.T. UENAKA, J.W. BERRY, and A.J. DEUTSCHMAN, JR.
University of Arizona, Tucson
Carbohydr. Res. 6(1): 18-24. January 1968
- 190-C ● **The Ultracentrifugation of Emulsions with Different Phase Volumes of Emulsified Oil**
R.C. GROOT¹ and R.D. VOLD²
¹Van 't Hoff Laboratory, University of Utrecht, Utrecht, The Netherlands, and ²University of Southern California, Los Angeles
Proc. Int. Congr. Surface Active Subst., 4th, Brussels, 1964, Sec. B, II: 1233-1242. 1967
- 21-G* ● **To Determine the Density Spectrum of Individual Grains**
LEORA SHELEF and NURI N. MOHSENIN
The Pennsylvania State University, University Park
Agr. Eng. 49(1): 28-29. January 1968
- 22-G ● **Preparative, Thin-Layer Chromatography in Carbohydrate Chemistry**
D. HORTON and TSUTOMU TSUCHIYA
The Ohio State University, Columbus.
Carbohydr. Res. 5(4): 426-432. December 1967

- 23-G • A Novel Reaction of a Nitro Sugar with Alcohols**
M.L. WOLFROM, U.G. NAYAK, and T. RADFORD
The Ohio State University, Columbus
Proc. Nat. Acad. Sci. 58(5): 1848-1851. November 1967
- 24-G • Amino Derivatives of Starches. Amination of 6-O-Tritylamylose**
M.L. WOLFROM, H. KATO, M.I. TAHA, A. SATO, G.U. YUEN,
T. KINOSHITA, and E.J. SOLTES
The Ohio State University, Columbus
J. Org. Chem. 32(10): 3086-3089. October 1967
- 25-G • Reaction of Alkyl Vinyl Ethers with Methyl α -D-Glucopyranoside**
M.L. WOLFROM, ANNE BEATTIE, and SHYAM S. BHATTACHARJEE
The Ohio State University, Columbus
J. Org. Chem. 33(3): 1067-1070. March 1968
- 26-G* • Apparatus for Determination of Bulk Modulus and Compressibility of Materials**
R.K. WHITE¹ and N.N. MOHSENIN²
¹The Ohio State University, Columbus, and ²The Pennsylvania
State University, University Park
Trans. Amer. Soc. Agr. Eng. 10(5): 670-671. May 1967
- 27-G* • Measurement of Viscoelastic Parameters in Food Materials**
NURI N. MOHSENIN and C.T. MORROW
The Pennsylvania State University, University Park
In "Rheology and Texture of Foodstuffs," SCI
Monograph No. 27, pp. 50-73. Society of Chemical
Industry, London. 1968
- [Report of research work supported with funds provided by the U.S.
Department of Agriculture under the authority of U.S. Public Law 480,
83rd Congress, and sponsored by the Northern Utilization Research and
Development Division.]
- 134-F • The Interaction of Starch with Bromine in Acid Solution**
JEHUDAH ELIASSAF and JEANINE BEL AYCHE
Institute for Fibres and Forest Products Research
Ministry of Commerce and Industry, Jerusalem, Israel
Carbohyd. Res. 5(4): 470-476. December 1967

- 200-F • **Conformation of O-Methylated Amylose and Cyclodextrins**
 B. CASU,¹ M. REGGIANI,¹ G.G. GALLO,² and A. VIGEVANI²
¹Scientific Institute of Chemistry and Biochemistry, Milan, Italy
²Lepetit Research Laboratories, Milan, Italy
 Tetrahedron 24(2): 803-821. January 1968
- 201-F • **Studies on Itaconic and Itatartaric Acid Production by Gamma Isolates of *Aspergillus terreus***
 JADWIGA JAKUBOWSKA, ANNA NOWAKOWSKA-WASZCZUK,
 EWA LASOTA-DULKOWSKA, ZOFIA ZAKOWSKA, and BARBARA SOBOCKA
 Technical University, Łódź, Poland
 Acta Microbiol. Pol. 16(3): 227-236. 1967
- 202-F • **Partial Hydrogenation of Soybean Oil with a Cu-Ni-Mn Catalyst by the Continuous System**
 YOSHIYUKI TOYAMA, YASUO KATSUMATA, and YOSHINORI KONDO
 Toyo University, Kawagoe, Saitama-ken, Japan
 Res. Rept. Fac. Eng., Toyo Univ., No. 3, 1-16 [1967]
- 203-F • **Distribution of Hydroxyethyl Groups in Commercial Hydroxyethyl Starch**
 H.C. SRIVASTAVA and K.V. RAMALINGAM
 The Ahmedabad Textile Industry's Research Association, Navrangpura,
 Ahmedabad, India
 Staerke 19(9): 295-300. September 1967
- 204-F • **Winterization of Partially Hydrogenated Soybean Oil**
 YOSHIYUKI TOYAMA, YOSHINORI KONDO, and YASUO KATSUMATA
 Toyo University, Kawagoe, Saitama-ken, Japan
 Res. Rept. Fac. Eng., Toyo Univ., No. 3, 17-26 [1967]
- 205-F • **Gel Filtration Fractionation of the Whole Water-Extractable Soybean Proteins**
 TETSUJIRO OBARA and MIYO KIMURA
 Tokyo University of Education, Komaba, Meguro, Tokyo, Japan
 J. Food Sci. 32(5): 531-534. September-October 1967
- 206-F • **Synthesis of 6-O-Palmitoyl- β -D-Glucosyl β -Sitosterol**
 TOSHIKO KIRIBUCHI, NORIO YASUMATSU, and SABURO FUNAHASHI
 The University of Tokyo, Tokyo, Japan
 Agr. Biol. Chem. 31(10): 1244-1247. October 1967

- 207-F ● **Milling of Solvent-Extracted Wheat, Semolina and Flour. I. Effect on Endosperm Fragmentation and Protein Shifting**
N.L. KENT and A.D. EVERS
Flour Milling and Baking Research Association, St. Albans, Herts, England
J. Sci. Food Agr. 19(1): 20-30. January 1968
- 208-F ● **Hydrodynamic Properties of Amylose Acetate in Nitromethane**
W. BANKS, C.T. GREENWOOD, and D.J. HOURSTON
University of Edinburgh, Edinburgh, Scotland
Trans. Faraday Soc. Part 2, 64(542): 363-370. February 1968
- 209-F ● **The Fractionation of Laboratory-Isolated Cereal Starches Using Dimethyl Sulphoxide**
W. BANKS and C.T. GREENWOOD
University of Edinburgh, Edinburgh, Scotland
Staerke 19(12): 394-398. December 1967
- 210-F ● **Cell Walls of *Streptococcus pyogenes*, Type 14. C Polysaccharide-Peptidoglycan and G Polysaccharide-Peptidoglycan Complexes**
EMILIO MUÑOZ, JEAN-MARIE GHUYSEN, and HANS HEYMANN
University of Liège, Liège, Belgium
Biochemistry 6(12): 3659-3670. December 1967
- 211-F ● **Mechanisms of Enzymatic Bacteriolysis**
JACK L. STROMINGER¹ and JEAN-MARIE GHUYSEN²
¹University of Wisconsin, Madison
²University of Liège, Liège, Belgium
Science 156(3772): 213-221. April 1967
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 SIN'ITIRÔ KAWAMURA, MINORU TADA, and TEIITI NARASAKI
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An English translation of this paper published in Japanese appeared in March 1967 in the Technical

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January – June 1968

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PATENTS

[These patents are assigned to the Secretary of Agriculture. Copies of patents may be purchased (50 cents each) from the Commissioner of Patents, U.S. Patent Office, Washington, D.C. 20231. Order by number, do not send stamps.]

Conjugation of Vegetable Oils via Iron Tricarbonyl Complex

EDWIN N. FRANKEL

U.S. Patent 3,373,175. March 12, 1968

Conjugation of polyunsaturated vegetable oils or methyl esters thereof with excess iron pentacarbonyl for 2-4 hours at a critical temperature of 185° C. provides markedly improved yields of conjugated fatty iron tricarbonyl complex that is then completely

decomposed with FeCl₃ to provide an almost fully conjugated drying oil product. At 185° C. the formation of conjugated complex is greatly increased, and the reaction need not be interrupted to vent complex inhibiting formations of CO.

Tetramethyl Cyclobutanediol Diesters of Linseed-Derived C₁₈ Saturated Vicinally Substituted Cyclic Monocarboxylic Acid Isomer Mixture

JOHN P. FRIEDRICH

U.S. Patent 3,373,176. March 12, 1968

The diesters formed by reacting 2 moles of saturated cyclized linolenic acid isomer mixture with 1 mole of 2,2,4,4-tetramethyl 1,3-cyclobutanediol ex-

hibit low pour points coupled with high resistance to thermal oxidation.

Saponified Starch Acrylate Grafts

LEWIS A. GUGLIEMELLI, MARY OLLIDENE WEAVER, and CHARLES R. RUSSELL
U.S. Patent 3,377,302. April 9, 1968

The saponified salt or free acid derivatives of hydrophobic starch grafts containing from 1 to 2 parts by weight of polyacrylate or polymethylacrylate side chains have improved hydrophilic properties over commercially available polyacrylic acids. Dilute

aqueous solutions or dispersions of the saponified starch ester grafts exhibit high viscosities even in the presence of shear. They have utility as industrial thickening agents for drilling muds, hydraulic fluids, and flocculents.

Cosmetic Compositions Containing Cyclic C_{18} and C_{20} Alcohols

EDWARD W. BELL and JOHN C. COWAN
U.S. Patent 3,383,284. May 14, 1968

Rapidly adsorbable cosmetic creams and lotions that are highly resistant to the development of rancidity and that do not require the masking of odoriferous constituents are provided by replacing the conventional lanolin and cetyl alcohol components

with disubstituted cyclohexane-type saturated C_{18} - C_{20} alcohol mixed isomers from the catalytic reduction of the corresponding vegetable oil-derived saturated cyclic acids.

Process for Production of an Alkali Starch Xanthate Solution

EARL B. LANCASTER, HOWARD F. CONWAY, LAURENCE A. WEINECKE, and
EDWARD L. GRIFFIN, JR.
U.S. Patent 3,385,719. May 28, 1968

Very low viscosity aqueous 10% 0.07 degree of substitution starch xanthate solutions are directly produced without a final addition of water by stirring starch or pregelatinized starch in the form of an aqueous dispersion containing only 10% of starch

based on the weight of the dispersion with up to 0.5 mole equivalents of NaOH and CS_2 , preferably at or only slightly above room temperature in a closed mixer for up to 1 hour.

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